Remarks

Claims 1-22 were previously pending in this application. Claims 23-26 were submitted but not entered because these claims would allegedly concern a new search in areas directed to recycling and would be unrelated to the subject matter of pending claims 1-22.

By this amendment, Applicants cancel claims 12 and 21 without prejudice or disclaimer. Claims 11, 17, and 22 are currently amended. New claim 27 is added. As a result claims 1 – 11, 13, 20, and 22 are pending for examination with claims 1, 11, 17, and 22 being independent claims. No new matter has been added and support for the amendments to claim 11, 17, and 22 as well as new claim 27 can be found in the specification, including the claims, as originally filed. For example, page 11 discusses treated water having a low conductivity of less than about 300 μS/cm and page 9 discusses treated water mixed with water from a point of entry.

Rejections Under 35 U.S.C. § 103

Claims 1-3 and 8-13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the teaching of Hark in U.S. Patent No. 4,808,287 (hereinafter "Hark") in view of the teaching of Batchelder et al. in U.S. Patent No. 6,126,805 (hereinafter "Batchelder").

Applicants disagree that claims 1-3 and 8-13 would have been obvious to one having ordinary skill in the art over the teaching Hark in view of the teaching of Batchelder.

Hark teaches a water purification process in which potable water from a municipal supply is treated to remove suspended solids, organic and inorganic dissolved solids, dissolved carbon dioxide gas and metal contaminants to produce ultra-pure water. The process involves pre-filtration of the water, activated carbon filtration, secondary guard filtration, and double reverse osmosis ("RO") treatment of the water; and an electrodialysis unit is used to further remove impurities in the water. (Hark at Abstract.) Hark explains that 96 % of the impurities are removed in a first RO system in the incoming water stream and 96 % of the impurities of the outlet from the first RO system are removed in a second RO system. (Hark at column 2, lines 49 *et seq.*) Clearly, the majority of impurities in the incoming water stream are removed by the sequentially arranged reverse osmosis devices and the electrodialysis unit is merely used as a polishing device to ensure that the produced ultra-pure water has a resistivity of at least

16 megohm-cm^3.

Preliminarily, the rejection is improper as failing to provide a *prima facie* case of obviousness because, *inter alia*, no motivation has been presented to modify the system disclosed Hark by incorporating the teachings of Batchelder.

Notably, Hark explains that the electrodialysis unit has electrodes that allow cleaning off contaminants and buildup and that the unit is operated to prevent overvoltage or hydrogen overvoltage. (Hark at column 4, lines 42 *et seq.*) It is clear that the teaching of Hark acknowledges that the electrodialysis unit is operated in a manner that generates hydroxyl ions by teaching operating the unit in a manner that removes precipitating products, from a reaction with hydroxyl ions. Stated another way, because hydroxyl ions are generated, Hark teaches reversing the polarity of the current applied through the electrochemical device.

Batchelder teaches that for applications involving filled cell electrodialysis, and reversing electrodialysis, "it would be desirable therefore to have cation exchange membranes which split water near or above their limiting current densities" for clean water. (Batchelder at column 6, line 52 to column 7, line 17.) To that end, Batchelder teaches cation exchange membranes which have, in at least those two surfaces in contact with a liquid in diluting compartments of an electrodialysis, reversing electrodialysis, electrodeionization or reversing electrodeionization apparatus, a predominant amount of strongly acidic cation exchange groups in a comparatively minor amount of weakly acidic and/or weakly basic groups that facilitate water splitting at currents near or above their Cowan-Brown limiting currents roughly similar to the water splitting exhibited by conventional anion exchange membranes near or above the limiting currents of the latter. (Batchelder at column 7, lines 20, *et seq.*) For example, Batchelder teaches electrodialysis stacks having cation exchange membranes with sulfonic acid groups and weakly acidic and/or basic groups; anion exchange membranes with quaternary ammonium and/or quaternary phosphonium groups and no primary, secondary, and/or tertiary amine and/or phosphine groups; and, as packing in dilute compartments, anion exchange granules which are selective to monovalent anions, or cation exchange granules which are selective to monovalent cations, or cation exchange granules with exchange groups being predominantly sulfonic acid groups and a minor amount of weakly acidic and/or weakly basic groups.

Clearly, neither of the references provides any teaching, suggestion, or motivation of a method comprising acts or steps of introducing water from a point of entry into an electrochemical device and removing at least a portion of any undesirable species from the water

in the electrochemical device while suppressing hydroxyl ion generation to produce treated water. Notably, contrary to what is alleged, Batchelder explicitly teaches that "[i]n order to maximize the utilization of ED apparatus it is desirable to operate at the highest possible current densities." (Batchelder at column 1, lines 62 *et seq.*, emphasis added.) Batchelder thus fails to provide any motivation to suppress hydroxyl ion generation while removing undesirable species from the water to be treated.

Stated plainly, to treat potable water, Batchelder teaches techniques, systems, and/or components that seek to split water to form hydrogen and hydroxyl ions. Indeed, the techniques of Batchelder teach against suppressing hydroxyl ion generation, especially when treating already purified water, as is the water treated from the reverse osmosis train of Hark. Therefore, an ordinarily skilled artisan relying on the teachings of Hark and Batchelder would not have suppressed hydroxyl ion formation but, instead, would have been motivated to split water.

Thus, even if the teachings of the references could have been combined, the proposed combination lacks at least one limitation of independent claims 1 and 11. For example, the alleged combined would have failed to disclose a method of producing treated water comprising at least one step or act of removing at least a portion of any undesirable species while suppressing hydroxyl ion generation, as recited in claim 1. Because the references also fail to disclose a method of producing treated water comprising at least one step or act of maintaining an electrical current below a limiting current density through an electrochemical device to produce water having a conductivity of less than about 300 μS/cm, any *prima facie* case of obviousness is further rebutted with respect to independent claim 11.

Dependent claims 2-3 and 8-10 as well as claims 12 and 13 depend from independent claims 1 and 11, respectively. These dependent claims would also not have been obvious over the teachings of Hark and Batchelder for at least the same reasons discussed above.

Claims 4-7 and 14-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the teaching of Hark in view of the teaching of Batchelder and in further in view of the teaching of Rela in U.S. Patent No. 6,607,668 (hereinafter "Rela").

As noted above, no *prima facie* case of obviousness has been presented that supports any motivation to combine the teaching of Hark with the teaching of Batchelder. Rela also fails to support any *prima facie* case of obviousness involving a combination of the teachings of Hark and Batchelder.

Rela teaches a water purifier having an integrated system that controls the components of the system. The water purifier includes a plurality of unit operations that represent stages in the water purification process. Supply water is pretreated by directing it into a sediment pre-filter module, a softener module, and a sediment removal and dechlorination module. (Rela at Abstract.) The pre-treated water is supplied to a reverse osmosis module which separates the water into two streams, a purified water stream and a concentrate stream. The purified water is passed to an electrodeionization module which further purifies the water. Purified water is further treated in an ultraviolet sterilization module. The sediment pre-filter module incorporates an automated cleaning or backwashing feature to flush the ceramic elements therein to remove accumulated particles from the surfaces of the ceramic elements. (Rela at column 5, line 66 – column 6, line 14.) Flushing the ceramic elements is performed at predetermined intervals by utilizing a high velocity water stream from a pure water reservoir in a direction opposite to the direction of the flow of supply water through the tubular element housing. (Id.) A water quality monitor measures ionic concentration in the pure water outlet from the electrodeionization module, which the control system utilizes to calculate electrical voltage and current directed so that optimum outlet water quality is achieved. (Rela at column 3, lines 62-67.) Control of the electrodeionization module entails measuring the flow rate and pressure of process streams, electrode streams, concentrate streams in the module. Controlling may further involve measuring various parameters of the system. Rela thus discloses integrating the various unit operations of a water purification system under the control of a controller.

Rela, however, fails to remedy the deficiencies of the teachings of Hark and Batchelder. For example, Rela fails to teach a method of producing treated water comprising at least one step of removing at least a portion of any undesirable species from the water while suppressing hydroxyl ion generation in an electrochemical device. Thus, dependent claims 4-7 and 14–16 also would not have been obvious over the teaching of Hark in view of the teaching of Batchelder and further in view of the teaching of Rela because, as discussed above, no *prima facie* case of obviousness has been properly set forth and because the references fail to teach each and every limitation recited in independent claims 1 and 11.

Claims 17, 18, and 20-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the teaching of Hark in view of the teaching of Batchelder and in further in view of the teaching of Rugh, II in U.S. Patent No. 4,102,752 (hereinafter "Rugh").

Applicants also disagree that claims 17, 18 and 20–22 would have been obvious over the teaching of Hark in view of the teaching of Batchelder and further in view of the teaching of Rugh because no *prima facie* case of obviousness has been presented that supports combining the teachings of these references and also because any *prima facie* case of obviousness is rebutted.

Preliminarily, neither Hark nor Batchelder teaches a water treatment system comprising a controller for regulating an electrical current below a limiting current density or a method comprising providing such a controller. Rugh, like Rela, also fails to cure the deficiencies of the teachings of Hark and Batchelder. Rugh teaches a municipal water supply system for providing potable water under pressure from sea water including a nuclear reactor heated boiler for raising the temperature of sea water to at least 250 °F and superatmospheric pressure means for conveying the superheated steam to an expansion turbine. (Rugh at Abstract.)

Further, no *prima facie* case of obviousness has been set forth for combining the teachings of the cited references.

Hark teaches utilizing pumps in a pressure regulation scheme in the disclosed purification system comprising reverse osmosis apparatus because "pressure control of the in line dual osmosis units is critical to the instant invention." (Hark at column 5, lines 1 *et seq.*, emphasis added) To that end, Hark teaches utilizing pumps to pressurize the fluid so as to overcome the thermodynamic resistance associated with reverse osmosis systems according to a particular scheme. No teaching, suggest, or motivation has been set forth for modifying the critical pressure regulating configuration of Hark so as to incorporate the alleged pressurized reservoir system of Rugh.

Significantly, Hark teaches utilizing a discharge pump to withdraw treated water from a storage tank so that it can be delivered to a user station. (Hark at Figure 1 and at column 4, lines 60, *et seq.*) Further, Hark teaches treating municipal water and storing the produced treated "ultra-pure water" whereas Rugh teaches a pressurized reservoir of municipal water. An ordinarily skilled artisan, reading the teachings of Hark and Rugh, would not have stored ultra-pure water in a reservoir containing municipal water. Thus, Hark directly contradicts what has been alleged as a motivation.

Thus, no *prima facie* case of obviousness has been properly set forth and because the proposed combination would fail to disclose each and every limitation recited in claims 17, 18, and 20-22, any *prima facie* case of obviousness is rebutted.

Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 103 is respectfully requested.

Withdrawn Claims

Applicants disagree that previously presented claims 23-26 would have required a new search in areas unrelated to those pertinent to the pending claims. A search in areas related to the pending claims would have uncovered art pertinent to claims 23-26.

Reconsideration and examination of withdrawn claims 23-26 is respectfully requested.

Conclusion

In view of the foregoing Amendments and Remarks, this application is in condition for allowance; notice to this effect is respectfully requested. If the Examiner believes that the application is not in condition for allowance, the Examiner is requested to call Applicants' attorney at the telephone number listed below.

If this Response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee

occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50/0214.

Respectfully submitted,
Evgeniya Freydina, et al., Applicants

By: _____

Peter C. Lando, Reg. No. 34,654
Elias Domingo, Reg. No. 52,827
LOWRIE, LANDO & ANASTASI, LLP
One Main Street
Cambridge, Massachusetts 02142
United States of America
Telephone: 617-395-7000
Facsimile: 617-395-7070

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